IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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APPLICANT:	**Baghdadi et al.**		
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EXAMINER:	**Patel, Vishal A.**		
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FOR: **Seal for a Turbine Engine**

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DATE: June 29, 2007

REVISED APPEAL BRIEF

Sir:

The Notification of Appeal was filed on February 26, 2007. A Notice of Non-Compliant Appeal Brief was mailed June 6, 2007.

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I. REAL PARTY IN INTEREST

The real party in interest in connection with the above identified patent application is Siemens Power Generation, Inc., the assignee of record.

II. RELATED APPEALS AND INTERFERENCES

There exist no related appeals or interferences in connection with the above-identified patent application.

III. STATUS OF CLAIMS

Claims 1-6, 9-16 and 19-20 were pending in this application. Claims 7, 8, 17 and 18 have been previously canceled without prejudice. Claims 1-6, 9-16 and 19-20 are being appealed.

IV. STATUS OF AMENDMENTS

No amendments were filed after issuance of the final office action dated November 21, 2006. All previous amendments have been entered.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Claim 1 is directed to a turbine engine having a seal (10) configured to form a seal between low and high pressure regions. The seal (10) is formed from a plurality of blades (16) extending radially from a rotatable body (12) and generally forming at least one row of blades and a plurality of blades (20) extending radially from a stationary body (14) towards the rotatable body (12) and generally forming at least one row of blades. The seal (10) may include a high pressure gas region (30) in the turbine engine that is proximate to the plurality of blades (20) extending radially from the stationary body (14) and opposite to the plurality of blades (16) extending radially from the rotatable body (12) and a low pressure gas region (28) in the turbine engine that is proximate to the plurality of blades (16) extending radially from the rotatable body (12) and opposite to the plurality of blades (20) extending radially from the stationary body (14), wherein the low pressure region (28) has a pressure less than the high pressure region (30). The plurality of blades (16) extending from the rotatable body (12) and the plurality of blades (20) extending from the stationary body (14) form the seal between the high pressure gas region (30) and the low pressure gas region (28). The plurality of blades (20) extending radially from the stationary body (14) are positioned proximate to the plurality of blades (16) extending from the rotatable body (12) and are nonparallel with the plurality of blades (16) extending from the rotatable body (12). The plurality of blades (20) extending radially from the stationary body (14) are positioned at an acute angle relative to a rotational axis (18) of the rotatable body (12) in the at least one row of blades that is generally orthogonal to the rotational axis (18). The plurality of blades (16) coupled to the

rotatable body (12) are positioned to direct fluids from the low pressure gas region (28) toward the high pressure gas region (30) to limit leakage of fluids from the high pressure gas region (30) proximate to the at least one row of blades (20) coupled to the stationary body (14) to the low pressure gas region (28) proximate to the at least one row of blades (16) coupled to the rotatable body (12). The claimed invention is described in the specification at pages 3 and 4 and shown in Figures 1 and 2.

Claim 11 is directed to a seal (10) formed from a plurality of blades (16) extending radially from a rotatable body (12) and positioned generally nonparallel to a rotational axis (18) of the rotatable body (12), wherein the plurality of blades (16) generally form at least one row of blades and a plurality of blades (20) extending radially from a stationary body (14) towards the rotatable body (12) and positioned nonparallel to the rotational axis (18) of the rotatable body (12), wherein the plurality of blades (20) form at least one row of blades; a high pressure gas region (30) in the turbine engine that is proximate to the plurality of blades (20) extending radially from the stationary body (14) and opposite to the plurality of blades (16) extending radially from the rotatable body (12). The seal (10) may include a low pressure gas region (28) in the turbine engine that is proximate to the plurality of blades (16) extending radially from the rotatable body (12) and opposite to the plurality of blades (20) extending radially from the stationary body (14), wherein the low pressure region (28) has a pressure less than the high pressure region (30). The plurality of blades (16) extending from the rotatable body (12) and the plurality of blades (20) extending from the stationary body

(14) form the seal between the high pressure gas region (30) and the low pressure gas region (28). The plurality of blades (20) extending radially from the stationary body (14) are positioned proximate to the plurality of blades (16) extending from the rotatable body (12) and are nonparallel with the plurality of blades (16) extending from the rotatable body (12), and the plurality of blades (20) extending radially from the stationary body (14) are positioned at an acute angle relative to a rotational axis (18) of the rotatable body (12) in the at least one row of blades that is generally orthogonal to the rotational axis (18). The plurality of blades (18) coupled to the rotatable body (12) are positioned to direct fluids from the low pressure gas region (28) toward the high pressure gas region (30) to limit leakage of fluids from the high pressure gas region (30) proximate to the at least one row of blades (20) coupled to the stationary body (14) to the low pressure gas region (28) proximate to the at least one row of blades (16) coupled to the rotatable body (12). The claimed invention is described in the specification at pages 3 and 4 and shown in Figures 1 and 2.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

The following grounds of rejection are requested to be reviewed on appeal. In particular, first, the Examiner rejected claims 1, 3-4, 9-11, 13-14 and 19-20 under 35 U.S.C. §103(a) as being unpatentable over United States Patent No. 3,575,523 to *Gross* in view of United States Patent No. 6,027,306 to *Bunker*, and further in view of United States Patent No. 1,689,735 to *Losel*. Second, the Examiner rejected claims 2, 5-6, 12 and 15-16 under 35 U.S.C. § 103(a) as being unpatentable over *Gross*, *Bunker* and *Losel* and further in view of United States Patent No. 4,571,937 to *Albers*.

VII. ARGUMENTS

I. REJECTION OF CLAIMS 1, 3-4, 9-11, 13-14, AND 19-20 UNDER 35 U.S.C. § 103

The Examiner rejected claims 1, 3-4, 9-11, 13-14, and 19-20 under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent No. 3,575,532 to *Gross* in view of U.S. Patent No. 6,027,306 to *Bunker*, further in view of U.S. Patent No. 1,689,735 to *Lösel*. The Examiner stated that *Gross* and *Bunker* disclose the claimed invention but fail to disclose that the plurality of blades extending from the stationary body are positioned at an acute angle relative to a rotational axis of the rotatable body. The Examiner stated that *Lösel* discloses a stationary member having a plurality of blades that are angled at an acute angle relative to a rotational axis of a shaft. The Examiner concluded that it would have been obvious to one or ordinary skill in the art at the time the invention was made to have the plurality of blades of *Gross* and *Bunker* angled at an acute angle as taught by *Lösel* to provide an effective labyrinth seal and to prolong the life of the seal.

As shown in Figure 2 and claimed in independent claims 1 and 11, the blades extending from the stationary body extend radially from the stationary body and at an acute angle. In particular, claims 1 and 11 state "a plurality of blades extending radially from a stationary body towards the rotatable body and generally forming at least one row of blades . . . and the plurality of blades extending radially from the stationary body are positioned at an acute angle relative to a rotational axis of the rotatable body in the at least one row of blades that is generally orthogonal to the rotational axis . . ." (emphasis added). Thus, the claimed

blades extend radially toward the rotational body and are positioned at an acute angle relative to a rotational axis. In sharp contrast, *Lösel* does not disclose a plurality of blades forming a single row of blades. Rather, *Lösel* discloses a plurality of single blades that each form continuous rings. Furthermore, *Lösel* does not disclose blades that extend radially toward a rotatable body and are positioned at an acute angle relative to a rotational axis. Instead, the continuous rings disclosed in *Lösel* do not extend radially toward the rotatable body. Rather, the continuous rings of *Lösel* extend at an acute angle relative to a radial axis extending from the rotational axis, as shown in Figure 2 of *Lösel*. In contrast, the claimed invention is directed to blades the project radially and at an acute angle relative to a rotational axis. Such a configuration, as shown in Figure 2 and claimed, is completely different than the configuration disclosed in *Lösel*. Thus, the blades disclosed in *Lösel* simply do not disclose the claimed structure, which is "the plurality of blades extending radially from the stationary body are positioned at an acute angle relative to a rotational axis of the rotatable body in the at least one row of blades that is generally orthogonal to the rotational axis . . ." (emphasis added).

Another way of describing the difference between the claimed invention and *Lösel* is that the intersection of the blade and the stationary support structure of *Lösel* is orthogonal to a rotational axis. The blade then extends from the intersection at an acute angle moving away from the base. In contrast, intersections of the claimed blades and the stationary support structures are not positioned orthogonal to the rotational axis; rather, the intersections of the claimed blades are positioned at an acute angle relative to the rotational axis. The

blades of the claimed invention do not extend at an acute angle from the stationary structure. Instead, the blades extend radially. Therefore, claims 1 and 11, and those claims depending therefrom, are patentable, and the Examiner is respectfully requested to withdraw the rejection.

II. REJECTION OF CLAIMS 2, 5-6, 12 AND 15-16 UNDER 35 U.S.C. § 103

The Examiner rejected claims 2, 5-6, 12 and 15-16 under 35 U.S.C. § 103(a) as being unpatentable over *Gross*, *Bunker* and *Lösel* as previously applied, and further in view of U.S. Patent No. 4,571,937 to *Albers*. The Examiner stated that *Gross* discloses the invention substantially as claimed but fails to disclose that the blades on the stationary body are annually spaced or formed intermittently and have an angle of about 1-89 degrees. The Examiner stated that *Albers* discloses a plurality of blades on a stationary body and the blades are angled to about 1-89 degrees from a rotational axis. The Examiner concluded that it would have been obvious to one of ordinary skill in the art at the time the invention was made to have the blades of *Gross* be segmented annularly or formed intermittently to provide a turbine that has substantially no efficiency losses.

Albers discloses a system for controlling the flow of leakage fluids and cooling air of a rotor proximate to a tip of a rotatable turbine blade. The system includes a plurality of blades extending radially inward from a stationary outer housing. The blades are positioned downstream of exhaust orifices in the tip of a turbine blade to direct cooling fluids exhausted from the turbine blades. The system is configured to redirect cooling fluids and combustion

gases in a particular direction for most efficient use in downstream turbine stages. The system of *Albers* is not a seal.

Claims 2, 5-6, 12 and 15-16 depend from claims 1 and 11, which are patentable for the reasons previously set forth. Thus, claims 2, 5-6, 12 and 15-16 are patentable. Furthermore, as discussed in Section II, claims 1 and 11 state that "the plurality of blades extending radially from the stationary body are positioned at an acute angle relative to a rotational axis of the rotatable body in the at least one row of blades that is generally orthogonal to the rotational axis." Claims 1 and 11 also state that "a low pressure gas region in the turbine engine that is proximate to the plurality of blades extending radially from [[a]] the rotatable body and opposite to the plurality of blades extending radially from the stationary body, wherein the low pressure region has a pressure less than the high pressure region." There exists no teaching or suggestion in *Albers*, *Gross* or *Bunker* for the combination of the blades of *Albers* with *Gross* or *Bunker* because the blades of *Albers* are used to redirect fluids flowing downstream of the turbine blade. Combination of these blades with the configurations disclosed in *Gross* and *Bunker* would yield blades on a rotational body with downstream blades on a stationary body for redirecting the downstream flow. The pumping action of the blades on the rotational body would direct fluids upstream and away from the blade of *Albers*.

In stark contrast, the claimed configuration includes blades extending from a stationary structure, wherein the blades are positioned upstream, between the blade on the rotational body and the high pressure region. Thus, in the claimed configuration, blades on

the rotational body direct fluids towards the high pressure region and towards the blades extending from the stationary body. Combination of *Albers*, *Gross* and *Bunker* would not yield the claimed invention because the stationary blades disclosed in *Albers* would not be positioned between the blades extending from the rotational body and the high pressure region. Rather, the stationary blades disclosed in *Albers* would be positioned between the blades extending from the rotational body and the low region. And such a difference would not be obvious to one of ordinary skill in the art to redesign because no such motivation was known in the art and is not disclosed in *Albers*, *Gross* and *Bunker*. Thus, for at least these reasons, amended claims 2, 5-6, 12 and 15-16 are allowable, and the Examiner is respectfully requested to withdraw the rejection.

VIII. CLAIMS APPENDIX

1. A turbine engine having a seal, comprising:

a plurality of blades extending radially from a rotatable body and generally forming at least one row of blades;

a plurality of blades extending radially from a stationary body towards the rotatable body and generally forming at least one row of blades;

a high pressure gas region in the turbine engine that is proximate to the plurality of blades extending radially from the stationary body and opposite to the plurality of blades extending radially from the rotatable body;

a low pressure gas region in the turbine engine that is proximate to the plurality of blades extending radially from the rotatable body and opposite to the plurality of blades extending radially from the stationary body, wherein the low pressure region has a pressure less than the high pressure region;

wherein the plurality of blades extending from the rotatable body and the plurality of blades extending from the stationary body form the seal between the high pressure gas region and the low pressure gas region;

wherein the plurality of blades extending radially from the stationary body are positioned proximate to the plurality of blades extending from the rotatable body and are nonparallel with the plurality of blades extending from the rotatable body, and the plurality of blades extending radially from the stationary body are positioned at an acute angle relative to

a rotational axis of the rotatable body in the at least one row of blades that is generally orthogonal to the rotational axis; and

wherein the plurality of blades coupled to the rotatable body are positioned to direct fluids from the low pressure gas region toward the high pressure gas region to limit leakage of fluids from the high pressure gas region proximate to the at least one row of blades coupled to the stationary body to the low pressure gas region proximate to the at least one row of blades coupled to the rotatable body.

2. The turbine engine having a seal of claim 1, wherein the plurality of blades extending radially from the stationary body are generally orthogonal to the plurality of blades extending from the rotatable body.

3. The turbine engine having a seal of claim 1, wherein the plurality of blades extending radially from the rotatable body are aligned at an angle of between about 1 degree and about 89 degrees relative to a rotational axis of the rotatable body.

4. The turbine engine having a seal of claim 3, wherein the plurality of blades extending radially from the rotatable body are aligned at an angle of about 60 degrees relative to a rotational axis of the rotatable body.

5. The turbine engine having a seal of claim 1, wherein the plurality of blades extending radially from the stationary body are aligned at an angle of between about 1 degree and about 89 degrees relative to a rotational axis of the rotatable body.

6. The turbine engine having a seal of claim 5, wherein the plurality of blades extending radially from the stationary body are aligned at an angle of about 60 degrees relative to a rotational axis of the rotatable body.

7. (Canceled)

8. (Canceled)

9. The turbine engine having a seal of claim 1, wherein the plurality of blades extending radially from the rotatable body extend to within about 0.6 millimeters radially from the stationary body.

10. The turbine engine having a seal of claim 1, wherein the plurality of blades extending radially from the stationary body extend to within about 0.6 millimeters radially from the rotatable body.

11. A turbine engine having a seal, comprising:

a plurality of blades extending radially from a rotatable body and positioned generally nonparallel to a rotational axis of the rotatable body, wherein the plurality of blades generally form at least one row of blades;

a plurality of blades extending radially from a stationary body towards the rotatable body and positioned nonparallel to the rotational axis of the rotatable body, wherein the plurality of blades form at least one row of blades; a high pressure gas region in the turbine engine that is proximate to the plurality of blades extending radially from the stationary body and opposite to the plurality of blades extending radially from the rotatable body;

a low pressure gas region in the turbine engine that is proximate to the plurality of blades extending radially from the rotatable body and opposite to the plurality of blades extending radially from the stationary body, wherein the low pressure region has a pressure less than the high pressure region;

wherein the plurality of blades extending from the rotatable body and the plurality of blades extending from the stationary body form the seal between the high pressure gas region and the low pressure gas region;

wherein the plurality of blades extending radially from the stationary body are positioned proximate to the plurality of blades extending from the rotatable body and are nonparallel with the plurality of blades extending from the rotatable body, and the plurality of blades extending radially from the stationary body are positioned at an acute angle relative to a rotational axis of the rotatable body in the at least one row of blades that is generally orthogonal to the rotational axis; and

wherein the plurality of blades coupled to the rotatable body are positioned to direct fluids from the low pressure gas region toward the high pressure gas region to limit leakage of fluids from the high pressure gas region proximate to the at least one row of blades coupled to the stationary body to the low pressure gas region proximate to the at least one row of blades coupled to the rotatable body.

12. The turbine engine having a seal of claim 11, wherein the plurality of blades extending radially from the stationary body are generally orthogonal to the plurality of blades extending from the rotatable body.

13. The turbine engine having a seal of claim 11, wherein the plurality of blades extending radially from the rotatable body are aligned at an angle of between about 1 degree and about 89 degrees relative to a rotational axis of the rotatable body.

14. The turbine engine having a seal of claim 13, wherein the plurality of blades extending radially from the rotatable body are aligned at an angle of about 60 degrees relative to a rotational axis of the rotatable body.

15. The turbine engine having a seal of claim 11, wherein the plurality of blades extending radially from the stationary body are aligned at an angle of between about 1 degree and about 89 degrees relative to a rotational axis of the rotatable body.

16. The turbine engine having a seal of claim 15, wherein the plurality of blades extending radially from the stationary body are aligned at an angle of about 60 degrees relative to a rotational axis of the rotatable body.

17. (Canceled)

18. (Canceled)

19. The turbine engine having a seal of claim 11, wherein the plurality of blades extending radially from the rotatable body extend to within about 0.6 millimeters radially from the stationary body.

20. The turbine engine having a seal of claim 11, wherein the plurality of blades extending radially from the stationary body extend to within about 0.6 millimeters radially from the rotatable body.

IX. EVIDENCE APPENDIX

None.

X. RELATED PROCEEDINGS APPENDIX

None.

CONCLUSION

For at least the reasons given above, claims 1-6, 9-16, 19 and 20 define patentable subject matter and are thus allowable. The Applicant requests withdrawal of the rejections and allowance of the claims.

Respectfully submitted,

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